Roll No: _____

CS6843 Program Analysis at IIT Madras

MidSem Mar 2, 2015

Duration: 75 minutes Number of questions: 6 **compulsory** questions

1. Guess the country who will win the Cricket World Cup this year. Why? [1 mark]

2. Disprove with example or prove: in live variables analysis (which is flow-sensitive), we define $in(B) = use(B) \cup (out(B) - def(B))$. If I remove -def(B) from this equation, then the analysis computes the same solution as a flow-insensitive analysis. [3 marks]

3. For the following program, compute the set of integer values variable c can take in context-sensitive, inter-procedural context-insensitive, and intra-procedural analysis. [6 marks]

```
main() {
        pa(1, 2);
        pa(3, 4);
        pa(5, 6);
}
```

```
pa(int a, int b) {
        c= a + b;
}
```

Context-sensitive: { }

Inter-procedural : { }

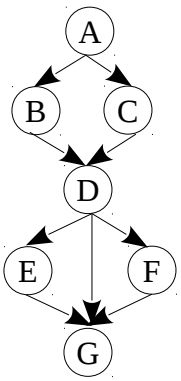
Intra-procedural : { }

4. For the following program, draw a control-dependence graph. Its nodes may be designated with line numbers instead of program text, if you wish. [5 marks]

```
1 main() {
2  int x = 0;
3  int n = 1;
4  int a[5] = {0, 2};
5  int i = 0;

6   if (n > 0) {
7       for (; i < n; ++i) {
8         a[i] = i * i;
9         if (a[i] < 100) {
10                x += a[i];
11        } else {
12                x -= a[i]
13        }
14      }
15   }
16   printf("%d\n", x);
17 }
```

5. Find an instrumentation across the edges of the following CFG such that different acyclic paths have a unique number between 0..P-1 where P is the number of paths. A is the start node and G is the end node. [5 marks]



Path id	Path
0	
1	
2	
3	
4	
5	
6	
7	

6. For the following nested loop, formulate the set of linear inequations to find out if **RAW** dependence exists across any two **different** iterations. Enter entries in the matrices and vectors below, you do not need to solve the equations. [5 marks]

```
for (i = 1; i < 10; ++i)
        for (j = i + 1; j < i + 10; ++j)
                a[i + 3*j – 1] = a[2*i – 8];
```